

# Montana Water Supply Outlook Report – Spring 2023



Missouri River near Great Falls

This report was prepared by the Department of Natural Resources & Conservation on behalf of the Governor's Drought & Water Supply Advisory Committee



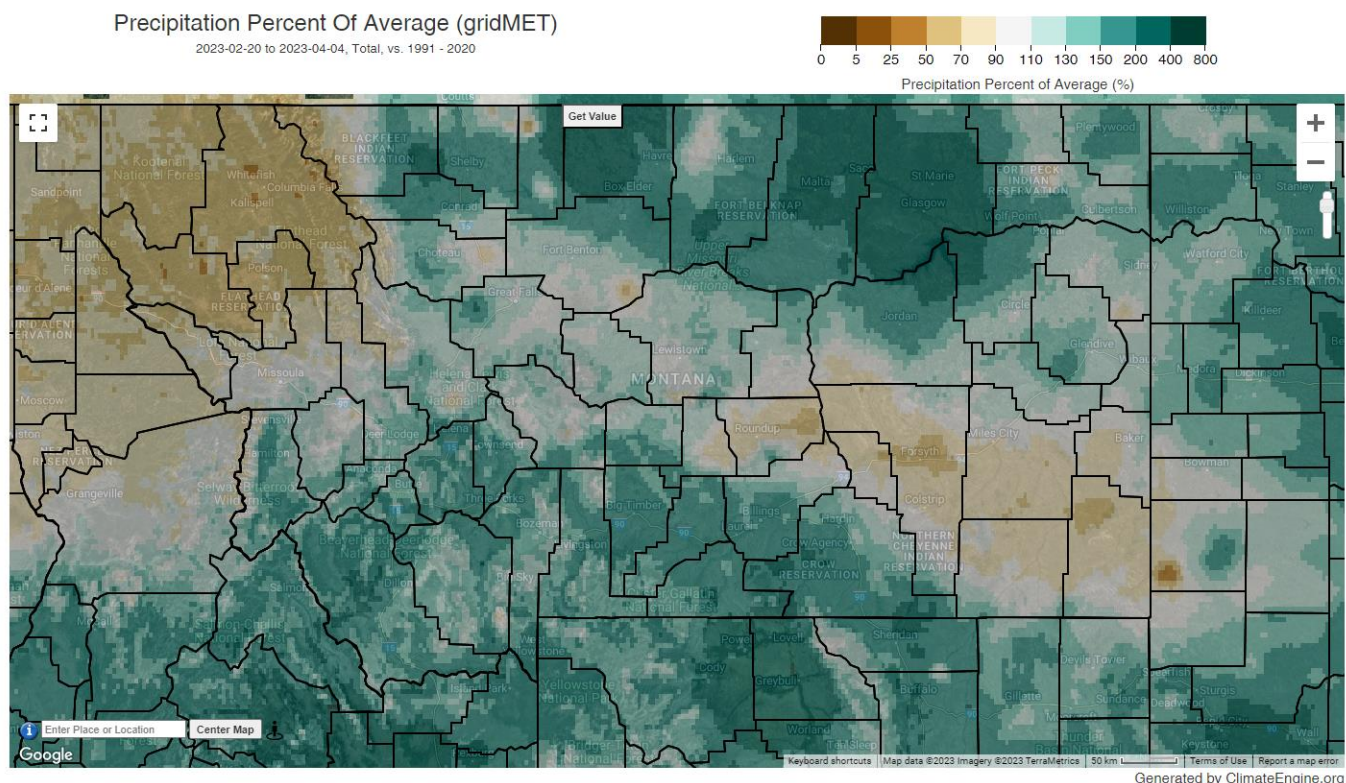


## Summary of Recent Conditions

As the 2022 water year (October 1, 2021 – September 30, 2022) closed, weather extremes remained the norm. Despite much warmer than average temperatures (August – October was the warmest on record), statewide precipitation was mostly average, falling to well below average in the northwest. Parts of central Montana proved the exception, receiving nearly twice the average rainfall in October. Conditions then shifted quickly, with November delivering much colder temperatures that averaged 5 to 7 degrees Fahrenheit below normal. The bitter cold persisted statewide through the first 3 weeks of December. West Yellowstone set a record low of minus 49 degrees Fahrenheit on December 22, 2022. Those extreme low temperatures were followed by record highs in some locations, with temperature swings of up to 90 degrees observed in some areas.

From the end of December through the third week in February, temperatures rose 4 to 6 degrees Fahrenheit above average statewide. With lower-than-average precipitation and higher-than-average temperatures in January, the prairie and mid and low elevations in the foothills lost accumulated snowpack in many areas. Isolated local flooding and complaints of mud-season in February were not uncommon. In the last week of February, temperatures flipped again, plummeting to 8 to 10 degrees below average through the first week in April. Northwest Montana was the exception where temperatures remained closer to average.

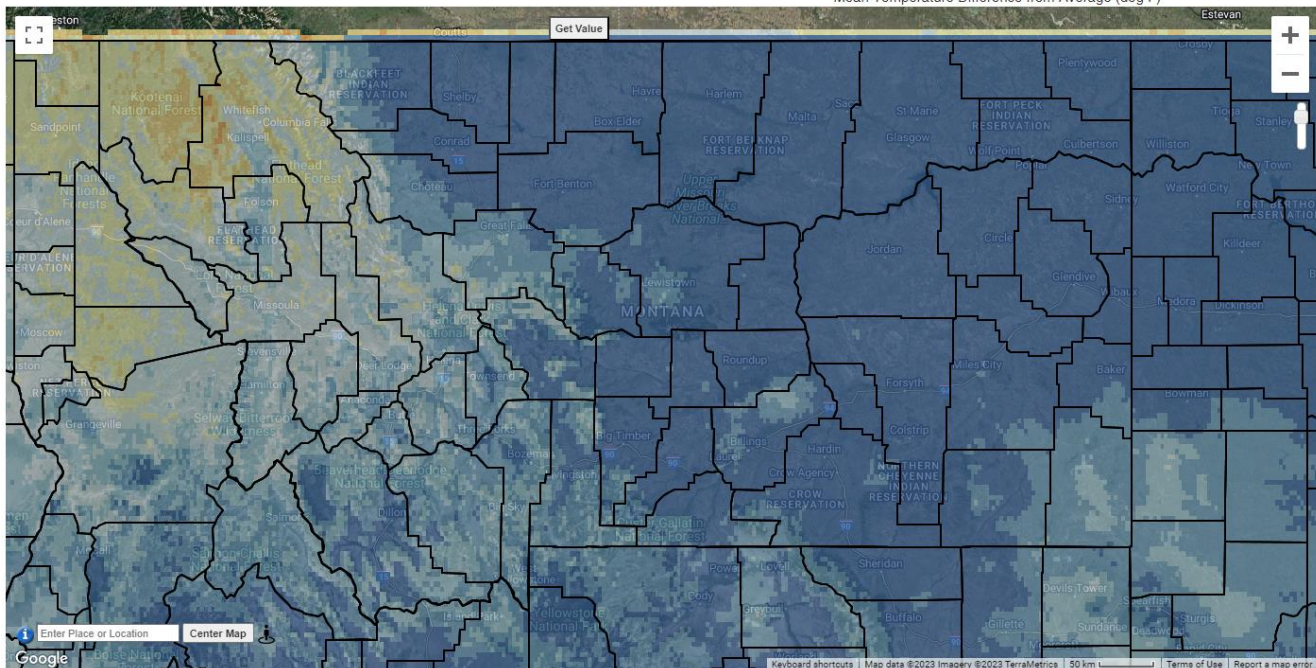
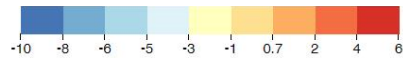
The winter storm track really got going again about the third week of February and continued through the second week in April, with storms in many areas arriving with a regularity not seen since 2019. As is often the case, the distribution was variable, and precipitation in the northwest and southeast fell to below normal during this period.



Percent of average precipitation – 2/20/23 – 4/4/23

## Mean Temperature Difference from Average (gridMET)

2023-02-20 to 2023-04-01, Median, vs. 1991 - 2020



## Difference from Average Temperature – 2/20/23 – 4/4/23

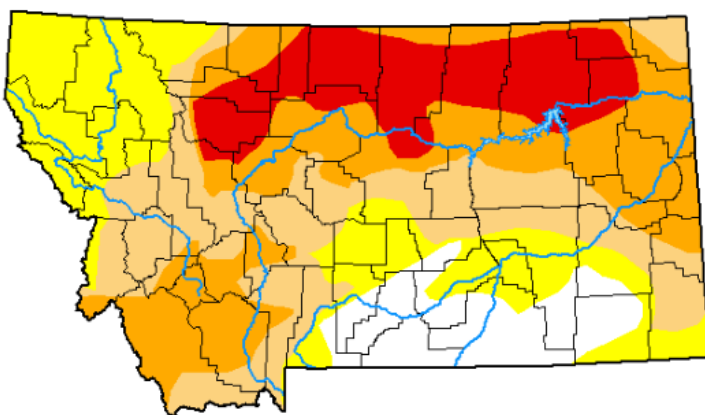
Drought conditions degraded through much of the fall, reaching their most serious point in early November with 58% of the state in severe to extreme (D2 to D3) drought. Average to above average precipitation in November, December, and March offered some respite with conditions regularly improving following two years of severe to exceptional drought.

## U.S. Drought Monitor Montana

**November 8, 2022**  
(Released Thursday, Nov. 10, 2022)  
Valid 7 a.m. EST

### Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	10.43	89.57	66.81	41.97	15.61	0.00
<b>Last Week</b> 11-01-2022	10.43	89.57	74.32	41.97	15.61	0.00
<b>3 Months Ago</b> 08-09-2022	49.43	50.57	28.13	15.53	3.59	0.00
<b>Start of Calendar Year</b> 01-04-2022	7.36	92.64	89.33	86.35	53.93	13.87
<b>Start of Water Year</b> 09-27-2022	5.40	94.60	77.46	45.05	12.35	0.00
<b>One Year Ago</b> 11-09-2021	0.00	100.00	100.00	100.00	69.68	22.25



### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

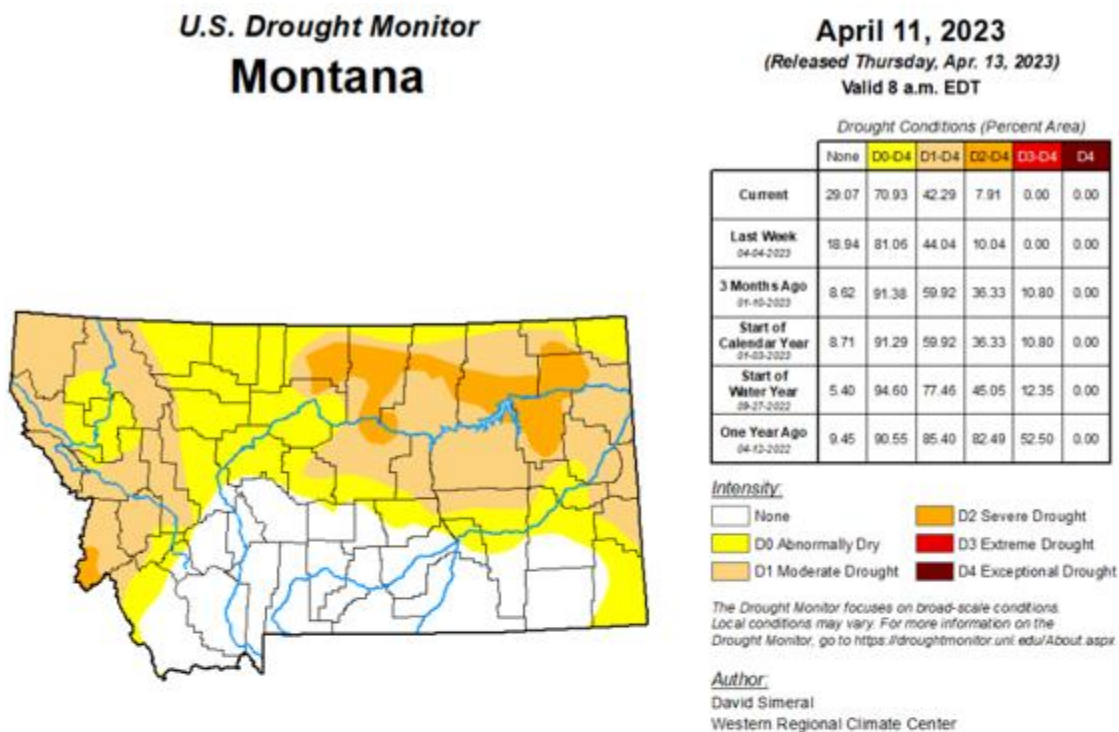
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

### Author:

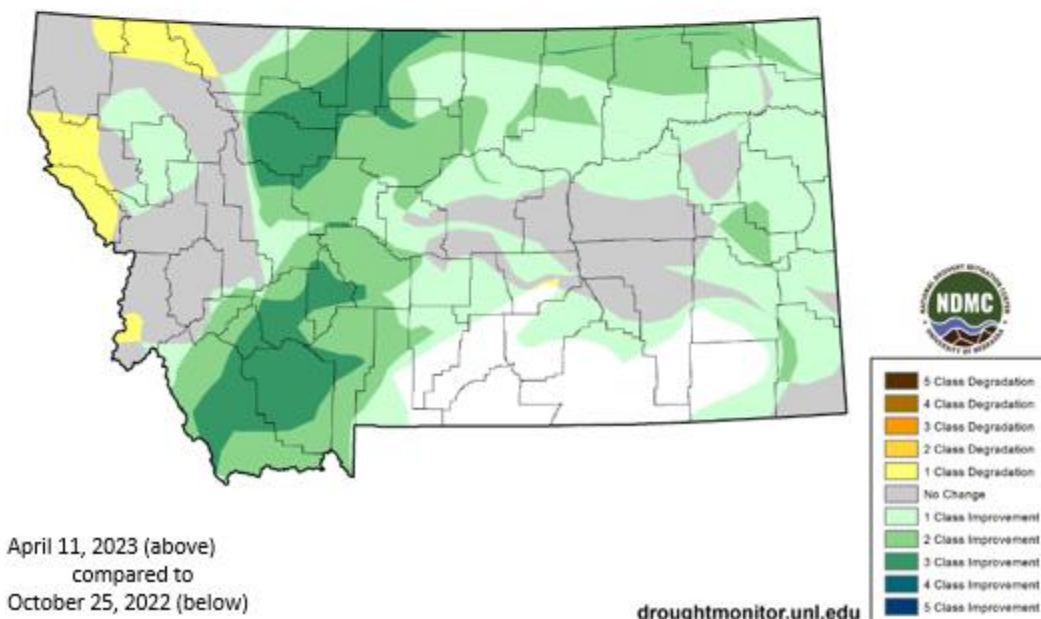
Brian Fuchs  
National Drought Mitigation Center



The map below shows the current drought condition as of 4/11/23 and the change in drought categories since mid-October as compared with current conditions. Colder than average temperatures have generally preserved snowpack at mid elevations, and this map is likely to improve throughout the spring. Conditions in northwest and southeast Montana could degrade, as lower than average precipitation over the last 3 months could result in reduced stream run-off and subsoil infiltration. Drought conditions could worsen there depending on the outcome and timing of spring precipitation and the onset of warmer temperatures.



**U.S. Drought Monitor Class Change - Montana**  
24 Week

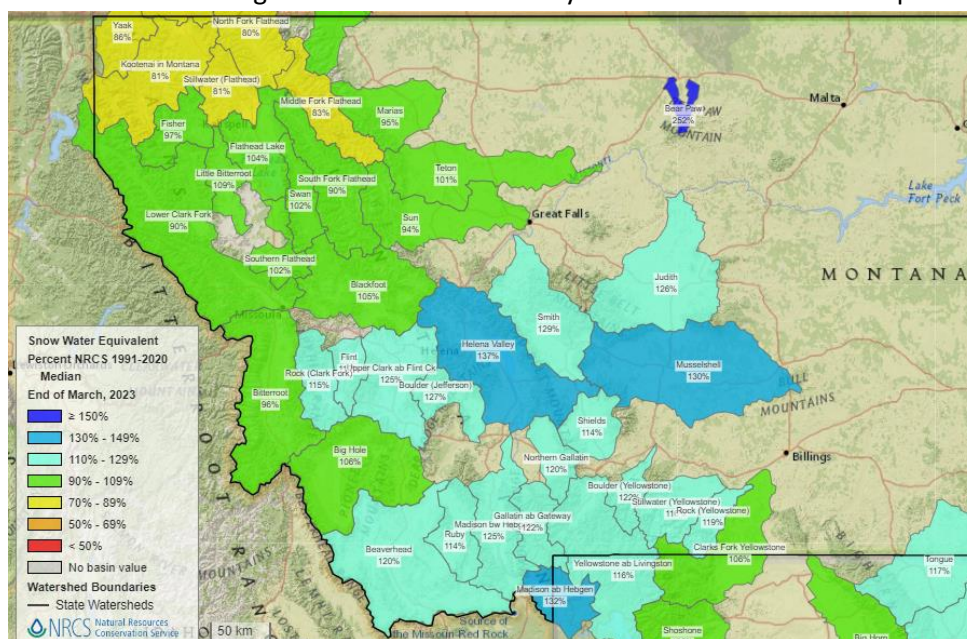


## Snowpack:

Late October marked the onset of seasonal snowpack accumulation, and cool and wet weather brought more accumulation in November and December. The largest snowfall events occurred during the first weeks of November and December, and again in late December. Unfortunately, temperatures were so warm during the late December storm that it rained even at higher elevations. Overall, snowpack accumulations made for a great early start to the season with all the major rivers basins at or above average by the end of the year. Below normal precipitation in January resulted in widespread drops in snowpack accumulations. River basins west of the Continental Divide saw a 20-30% decrease in their snowpack percentages.

While many Montana river basins experienced a decrease in the seasonal snowpack percentages in January, above normal precipitation during February and March offered a timely rebound. Snowpack percentages increased in most basins east of the continental divide ranging from 114% in the Bighorn River basin to about 135% in Central Montana from Lewistown to Helena. Snowpack in the Bear Paw Mountains is the noteworthy outlier. As of March 31<sup>st</sup> the basin was about 250% of normal. The accumulated snowpack presents a dramatic increase as compared to April 1, 2022, when many SNOTEL stations reported the lowest or near lowest snowpack on record.

With cooler temperatures prevailing through March and into early April, many parts of Montana still have snow on the ground into the second week of April. In an average year, prairie snowpack is gone by mid-March, and this year's later snowmelt has the potential to improve soil moisture and ephemeral storage in areas that are still holding snow. Areas with a northerly aspect could benefit from the late snowpack well into early summer. As we move through spring, May and June are typically some of the "wettest" months of the year in watersheds east of the divide. West of the divide, precipitation generally tapers off as summer approaches. In areas where snowpack appears somewhat below average, particularly northwest Montana, monitoring precipitation and day and night-time temperatures through April, May, and June will be important for determining conditions through the remainder of summer. With warmer than average temperatures forecast for the next 3 weeks and no clear signal for precipitation, it is possible that the lower elevation snowpack has already reached its peak for the season in most watersheds across Montana. High elevation sites will likely continue to increase snowpack into mid-May.

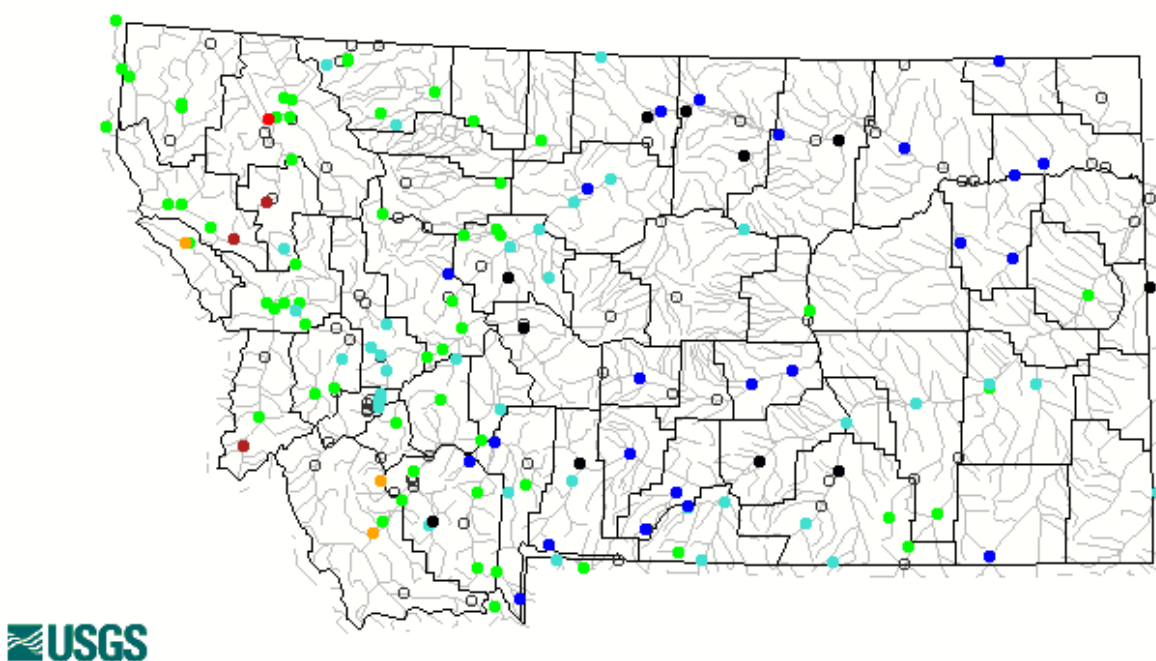


Basin SWE accumulation as measured by SNOTEL through March 2023

## Streamflow: ([DNRC/USGS/Gaging Stations](#), [USGS WaterWatch](#), [Missouri Basin River Forecast Center](#))

Statewide, the snowpack currently varies from much above average in the southwest to much below average in the northwest. As a result, the translation of current snowpack into summer stream forecasts remains somewhat uncertain and will depend upon temperatures and the effect that has on the rate of snowmelt. Warmer temperatures will accelerate runoff, while cooler than average temperatures could suppress runoff, effectively extending the season. Snowpack is a critical component of early season streamflow across the state, but not the only component. Total water year precipitation, peak snowpack accumulation, spring and summer precipitation and the departure from seasonal average temperatures all contribute to the overall water volume available during the growing season.

According to NRCS and other data sources, the snowpack in the southern parts of Beaverhead, Madison, and Gallatin counties is exceptional, resulting in 50% exceedance streamflow forecasts that currently range from about 120- 180% of normal. In that region many of those forecasts are the highest or second highest in 10 years and comparable to 2018 and 2014. West of the divide, streamflow forecasts are highest in the southern Mission Mountain region and the Upper Clark Fork River basin at about 110-130% of normal. Northern Kootenai and northern Flathead River basin streamflows are forecasted at about 70-90% of normal. This winter's snowpack will provide ample runoff this spring and early summer, however, water users should continue to keep a close eye on day-to-day and week-to-week weather patterns. A prolonged period of high pressure with abundant sunshine, high daily temperatures, and nights with above freezing temperatures could release a substantial amount of water in a short period resulting in local and potentially regional flooding.



Real-time streamflow as compared to historical streamflow for Saturday April 13, 2023

Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

## **Reservoirs:** ([Bureau of Reclamation Reservoirs](#), [State Reservoirs](#))

Water elevations at many state water projects across Montana are currently below average. Those lower levels are due in part to extremely low levels following the summer's irrigation season and the impact of two years of severe to extreme drought. The lower levels this spring are also partly due to cooler than average temperatures that have delayed spring run-off. Generally, prospects for water storage this spring are better than we have seen for the previous three years. Apart from the northwest, where projected run-off is below average, well-above normal to record snowpack in some areas should provide adequate supply to fill most reservoirs in the state. State water projects in the Musselshell basin could prove the exception due to extremely low levels in Bair, Martinsdale and Deadmans reservoirs. Nilan reservoir near Augusta is also much below normal. The Bureau of Reclamation (USBOR) and Army Corps of Engineers (USACE) are actively managing large reservoir projects across the state. Hungry Horse Reservoir and Lake Kookanusa are likely to receive below average inflows, while the Missouri headwaters and mainstem reservoirs will receive above normal inflows due to the heavy snowpack in the headwaters. These projects provide for flood control and water for power, agricultural use and recreation.

This year presents a challenge to water managers across the state as they balance the need to maintain flood pool for the coming run-off while filling reservoirs for summer storage. Once a reservoir fills and spills, water managers have little control of the releases to the river, which could impact people and infrastructure downstream. Other small irrigator-controlled projects across the state share a similar situation this year, and water managers should be aware of the substantial inflows forecasted for most reservoirs in southwest and central Montana. Ultimately, the fill rate and storage levels of all reservoirs will largely depend on the weather in the coming weeks through June. There is still a substantial amount of snowpack remaining in the mid and higher elevations this year that portends well for summer and late season streamflows.

Following three years of high temperatures, below normal precipitation and depleted storage levels, prospects for filling the small reservoirs and stock water ponds in the eastern two-thirds of the state is better than we have seen in some time. Extremely hot and dry conditions in 2021 and 2022 severely depleted soil moisture so it may take some time for soil moisture and associated shallow groundwater storage to recover. April, May and June are typically the wettest months of the year east of the divide, so current prospects for recovery are good to excellent (although conditions will vary locally).

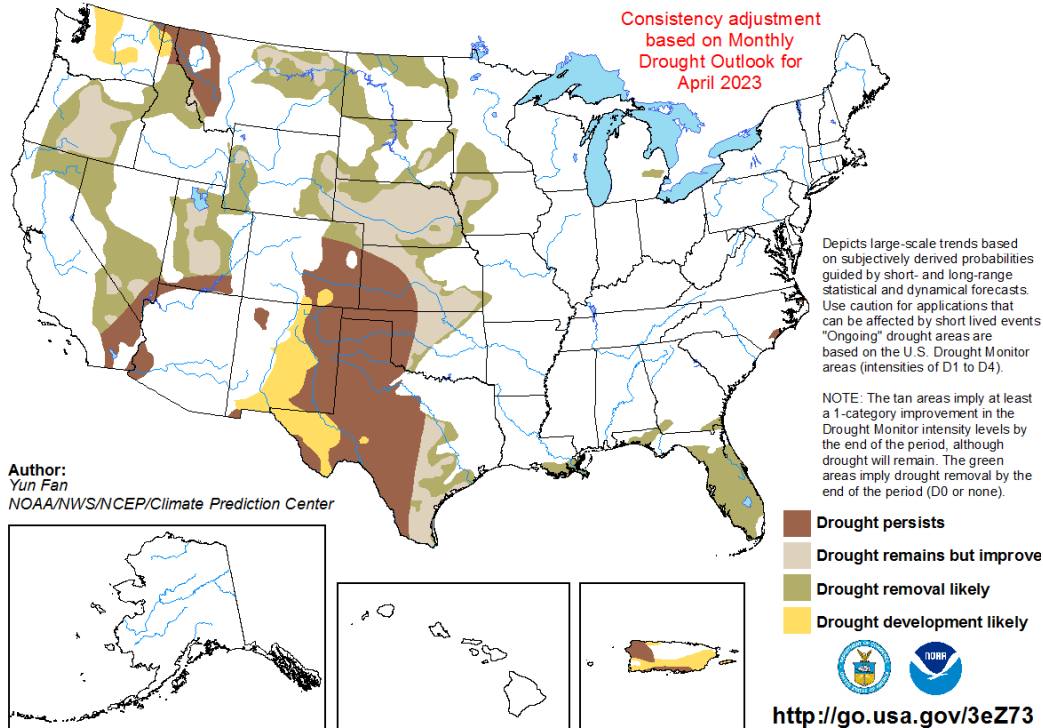
## **Drought Outlook:**

Current drought conditions (abnormally dry (D0) to severely dry (D2) across Montana are the result of three years of above average temperatures and below average precipitation. While the drought in the early 2000's lasted longer, the current drought is the most severe that Montana has experienced in more than 20 years. Looking ahead, the average to above average precipitation last fall and this winter and colder than normal temperatures have greatly improved the long-term drought outlook as we move into spring and summer. However, conditions will hinge on both temperature and precipitation. The benefits of a cool and wet spring could vanish quickly in the event of record hot and dry conditions like those experienced in June of 2021. Northwest Montana is currently the area of highest concern for potential drought development this summer. The southeast is another area of concern. Looking back at recent history, in early April over 21 of the last 22 years at least some part of Montana has been in some category of drought. In 10 of those years, statewide drought conditions improved between early April and late June, but in 10 of those years conditions worsened.



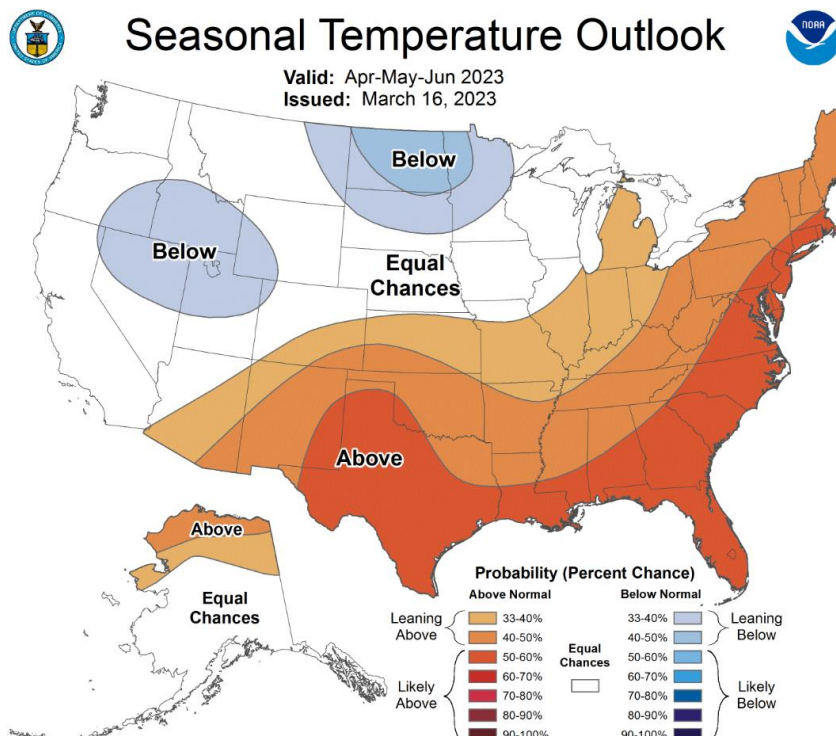
## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for April 1 - June 30, 2023  
Released March 31, 2023



### Long Term Forecast:

The long-term outlook (3 months) leans to below average temperatures in the northeast to southeast with no clear indication across the rest of the state. The long-term precipitation forecast indicates the potential for below normal precipitation in the northwest but does not offer any specific direction for remainder of the state. The long term outlook is substantially better for the west and Northern Great Plains than for the southwest, southcentral, southeast and east areas of the United States, which is forecast for above to much-above normal temperatures and below normal precipitation in the southwest.



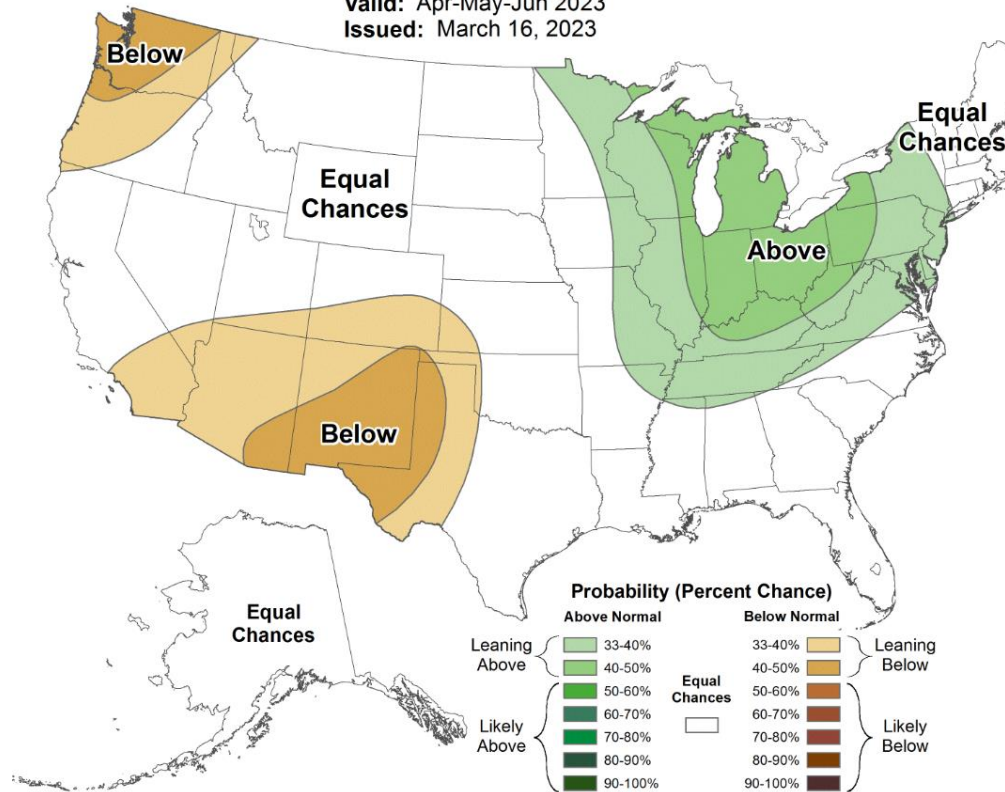




# Seasonal Precipitation Outlook



Valid: Apr-May-Jun 2023  
Issued: March 16, 2023



## Key Take-Aways:

- Much of the state, particularly northcentral Montana, is entering the third year of drought. However, conditions have improved dramatically from one year ago and the wetter than average and cooler than average fall and winter offers a good indication that drought conditions may continue to improve in the coming months.
- Statewide, the snowpack currently varies from much above average in the southwest to much below average in the northwest.
- With additional opportunity to add to the mountain snowpack in the coming weeks, the outlook for spring and summer runoff is good to excellent across much of Montana.
- High snowpack and positive streamflow forecasts suggest that most of Montana's reservoirs should fill to capacity this spring.
- Much colder than average temperatures in March and early April have delayed snowmelt and the potential for local flooding is high over the next several weeks.
- The next 8 to 10 weeks is a critical period. Depending on temperatures and accumulated precipitation, conditions have the potential to improve or degrade statewide. Current forecasts suggest a favorable trend for the water supply and drought outlook in the coming weeks.

**Drought Evaluation Tools and Resources** – The following resources provide useful tools that the Department of Natural Resources & Conservation (DNRC) and their partners use to evaluate drought and water supply conditions on a weekly basis across Montana.

[Upper Missouri River Drought Indicators Dashboard](#)

[Montana Drought Impacts Reporter](#)

[NRCS Interactive Precip Portal](#)

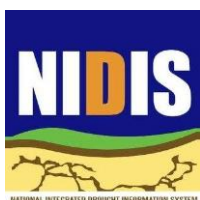
[USGS Water Watch Dashboard](#)

[Montana Mesonet Data Downloader](#)

Working on behalf of the Governor's Drought and Water Supply Advisory Committee, DNRC has compiled this Spring Water Supply and Drought Outlook. This report provides a synopsis of statewide conditions gleaned from multiple sources and offers links to additional resources with more in-depth information.

In partnership with other state and federal agencies and Tribes, experts in climate science, snowpack, streamflow and weather information collect and evaluate drought and water supply data on a weekly basis year-round. This information is distilled into weekly recommendations to the U.S. Drought Monitor which tracks drought conditions nationally. Much of the information contained in this report comes from the [Montana Climate Office](#), [NRCS Water Supply Outlook Reports](#), [U.S. Drought Monitor](#), [Climate Prediction Center](#), [National Integrated Drought Information System](#) and others. Please contact [Michael Downey](#), at DNRC (mdowney2@mt.gov) if you have any questions or feedback about any of the information contained in this report. Keep an eye out for the next drought update in late June.

This report would not be possible without the ongoing participation and contributions of our local, university, state, Tribal and federal partners, some of which are listed below:



This report was developed by DNRC on behalf of the Governor's Drought & Water Supply Advisory Committee pursuant to MCA 2-15-3308(5).